Factors Restricting the Use of Tractors by Small-Scale Farmers in Vhembe District, Limpopo Province, South Africa

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Factors Restricting the Use of Tractors by Small-Scale Farmers in Vhembe District, Limpopo Province, South Africa

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This study was conducted to assess the level of use of tractors in Vhembe district, Limpopo province. Soils in this district are generally fertile and support irrigated and dryland agriculture. Although some farmers own tractors and other farm implements, mainly for hiring out, much land remains unplowed. Owing to lack of operational knowledge, some equipment is not used or is used only during the plowing season, and so runs at a loss. As a result, it is difficult for tractor owners to cover their expenses, since most of the time the tractors sit idle. The aims of this study were to assess the level of use of tractors in Vhembe, to investigate the types of tractors and implements owned by farmers and how they can be fully used, to determine the costs of running tractors, and to propose how tractors and other farm implements can be fully used throughout the year. Fifty owners and operators in Vhembe's four municipalities were interviewed. The available tractors were used for tillage only during the rainy months and sat idle during the dry months. Infrequent rain and lack of skills at operating implements caused serious problems for farmers. The area to be cultivated, tractor efficiency, and number of rainy days strongly influenced the level of tractor use. The necessity of appropriate mechanization planning for Vhembe is discussed. The number of tractors needs to be increased and will require outside assistance to help farmers acquire machinery, to train operators, and to provide after-sales services.

Key words: Tractors, utilization level, farmer support, skills development, Limpopo agriculture

1. Introduction

Agriculture in South Africa

Agricultural exports constitute 8% of South Africa's total exports. Agriculture supports around 9% of formal employment—relatively low compared with other parts of Africa—and provides work for casual laborers, contributing around 2.6% of the nation's GDP. The gross income from all agricultural products in South Africa in 2005 amounted to R68,298 million (South Africa Online, 2008). The main staple food crop is maize (corn) Around 9 million t is produced every year, of which 7.4 million t is consumed and the rest exported and the balance feed to animals (South Africa Online, 2008). Soil tillage accounts for 36% of total maize production costs in South Africa (Du Toit, 1999). South Africa's dry climate allows only 13% of the land area to be used for crop production, and only 22% has high potential (South Africa Online, 2008). In most parts of South Africa including Limpopo, rainfall is sometimes not enough to maximize yields.

Limpopo Province

Limpopo is the northernmost province of South Africa (Fig. 1). Its total land area is 11,960,600 ha, of which 88.2% is farmland. Potential arable land accounts for only 14% of the total area of farmland. Limpopo's climate is suitable for agricultural production. Two regions of the province have more than 700 mm rainfall per year, but the rest is arid. About 137,000 ha is irrigated, of which 58,000 ha is in the hands of small-scale farmers. Limpopo province produces 60% of South Africa's fruit, vegetable, maize, wheat, and cotton (Limpopo Tourism

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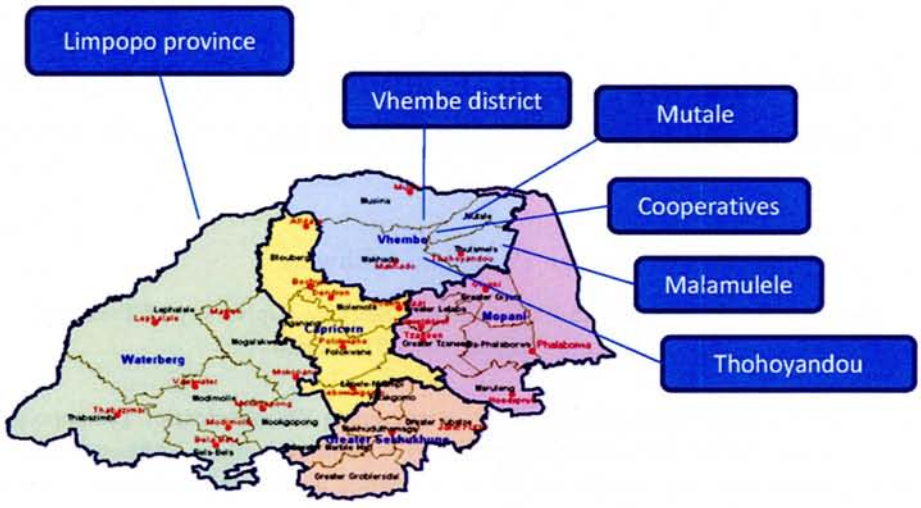

Fig. 1. Map of Limpopo province showing Vhembe district and study sites.

and Parks Board, 2008). As a province, Limpopo contribute 75% of South Africa's mangoes, 65% of its papayas, 36% of its tea, 25% of citrus, bananas and litchis, 60% of its avocados and tomatoes, and 285,000 t of potatoes produced (Limpopo Tourism and Parks Board, 2008). The Limpopo government identifies agriculture as one of the cornerstones of economic progress, along with mining and tourism.

Limpopo has diverse soils, which vary in productivity. The characteristics of the soils, climate, and topography make 37.7% of the land suitable for arable farming, 50.1% suitable for grazing, and 12.2% suitable for wildlife. Given the fact that 89% of the population of Limpopo province is classified as rural, agriculture plays a major role in the economic development of its rural regions (Limpopo Department of Agriculture, 2008). Vhembe is one of the five districts of Limpopo, and is administered from Thohoyandou. It has a population of 1.2 million (Statistics South Africa, 2001) in four municipalities: Thulamela, Makhado, Mutale, and Musina. Rainfall is low, ranging from 300 to 800 mm per year. Temperatures range between 17 and 27℃ in summer and between 4 and 20℃ in winter (Marete, 2003).

Economic Development in Limpopo

To achieve Limpopo's goals of growing the economy, alleviating poverty, and creating jobs, 264 staff qualified in animal production, crop production, soil, planning, and home economics service Vhembe (Raidimi, 2003). Farm mechanization is viewed as a means to creating employment opportunities but has cost farming communities more than it has yielded. This situation is a typical outcome of centrally planned economies where mechanization is heavily subsidized through the provision of government-planned and operated machinery services (Clarke, 1977). Similar models of government provision of services have been tried in many developing countries and have in many cases failed (Clarke, 1977). Twelve of 14 countries in sub-Saharan Africa have failed to sustain the use of new sources of farm power (Bishop-Sambrook, 2005). Such a decline has resulted in expensive repairs, poor maintenance and repair facilities, and difficulties in obtaining spare parts.

Technical Knowledge and Skills

The agricultural sector has the capacity for jobs to be created, but without attention to training and service providers, the full benefits of farm mechanization cannot be realized. Similarly, without operational knowledge and skills, many farm implements in farmers' possession cannot be used. Various training grants are available from government, but farmers who are not organized in farmers groups remain unaware of the grants. Without maintenance and record keeping, owners cannot know whether they are running a tractor at a profit or a loss. Regular maintenance protects machinery against breakdown and extends machine life. A lack of skilled agricultural engineers and workers,

poor facilities for repair, maintenance and manufacture of implements and high costs hamper improved mechanization (Singh and Verma, 2001). Difficulties in getting the correct spares encourage the use of cheap reconditioned parts that do not fit correctly and compromise repairs (Holtkamp, 1990).

Aims

The aim of this research project was to 1) assess the level of use of tractors in Vhembe district, 2) investigate the types of machinery owned and how they can be fully used all year round, 3) determine the costs of running tractors and 4) propose how to improve the use of tractors during the dry months.

2. Methods

Study Area

This study was conducted in three municipalities of Vhembe district: Mutale, in the northeast; Thohoyandou in the center east; and Malamulele, in the east. Water is available year-round from the Limpopo, Luvuvhu, and Olifant rivers. Irrigation consumes about half of the water used in Limpopo. Twelve villages were surveyed—in Mutale: Khakhu, Folovhodwe, Thengwe, and Dzimauli; in Thohoyandou: Dzindi, Tshikhudini, Tshisaulu, and Tshiombo; and in Malamulele: Mhinga, Xhikundu, Mavambe, and Maphophe.

Data Collection

Data were collected through the use of questionnaires, by checking farm records, from personal contacts, and from photographs. Tractor owners and operators were polled with a structured questionnaire composed of closed questions targeted at personal details such as name, age, gender, and training, and open questions targeted mostly at tractor details such as make, year of purchase, level of use, and maintenance. District and ward research scientists were also contacted for detailed information about the study region and farming conditions. Photographs were used to compare different tractor makes, use, and management in the four zones from the three municipalities. Data on the use of tractors, available machinery, operational knowledge, and rainfall were used to assess the potential for tractor hire in Vhembe.

3. Results and Discussion

Farm Machinery Ownership and Selection

Most farmers in Vhembe own tractors produced in Western countries (Table 1). In Mutale, Thohoyandou, and Malamulele, individual farmers own tractors. However, under Cooperatives tractors are collectively owned and managed. Farmers select tractors and implements on the basis not of performance, but of availability and price. This leads to problems of mismatch, which increases fuel consumption. Farmers also own a variety of farm implements (Table 2), many of which they don't know how to use. Implements are important, but it is not economically sensible to own a large number of different implements, each of which can be used in only a limited number of situations. Most farmers face the dilemma of whether to buy or hire equipment. Critical factors in deciding include annual use, availability of capital, and availability and dependability of customer service (Fairbanks *et al.,* 1971).

Use of Tractors in Vhembe

The low, summer-dominant rainfall in Vhembe makes tractor use impractical for much of the year (Fig. 2). Tractors sit idle for many months, the peak period for tractor use is between September and December were more than 23 tractors were working per month (Fig. 3). Table 3 shows the number of days per month when rainfall data indicated that cultivation was possible. Even in the rainy season, from October to May, cultivation was possible on no more than 6 days a month. During dry weather, the farmers put their names on a list to hire a tractor, but those further down the list miss the good weather by the time their turn comes. Those who resort to animal power or manual labor, faces a problem that it takes them long time to complete soil preparation and this results in low yields. From the study area all previous government-run tractor-hire schemes have been abandoned, and all tractors are now in private ownership (Simalenga, 2003). Most tractors used in Vhembe are second-hand, in poor condition, overworked, and unreliable, being on average older than 15 years, and most owners do not have the expertise to repair and maintain them. Only 9 of 50 tractors were bought new (Table 4).

Table 1. List of tractor brands and purchase information by respondents

ID	Status of respondent	Town	Tractor make, model & purchase	Year purchased	Purchase price [Rand]
Mutale					
1	operator	Dzimauli	MF 165, 2nd hand	1996	25,000
2	owner/operator		MF 265, 2nd hand	1996	22,000
3	owner/operator		Ford 4000, 2nd hand	2001	10,000
4	operator		MF 165, 2nd hand	1993	20,000
5	owner/operator		Fiat 550, 2nd hand	2000	28,000
6	operator		Leyland, 2nd hand	1998	4,000
7	owner		Ford 5000, 2nd hand	2000	15,000
19	owner	Folovhodwe	MF 135, 2nd hand	2000	30,000
20	owner		Ford 6600, 2nd hand	1998	23,000
11	owner	Khakhu	Fiat 640, 2nd hand	1996	6,000
12	owner/operator		MF 135, 2nd hand	1983	10,000
13	owner		MF 165, 2nd hand	1992	41,000
15	owner/operator	Thengwe	MF 135, 2nd hand	1973	5,000
16	owner		MF 165, 2nd hand	1971	20,000
17	owner/operator		MF 135, 2nd hand	1973	7,000
18	owner/operator		Ford 4000, 2nd hand	1988	21,500
Thohoyandou					
22	operator	Dzindi	MF 265, 2nd hand	2001	24,000
23	operator/student		Agrid G94, new	2002	19,000
24	owner		MF 135, 2nd hand	1992	20,000
25	owner/operator		MF 135, 2nd hand	1968	5,000
45	owner	Tshikhudini	Ford 5000, 2nd hand	2001	35,000
30	owner/operator	Tshiombo	Ford 5000, 2nd hand	1998	23,000
31	owner		Fiat 540, 2nd hand	1992	24,000
32	owner		Ford 5000, 2nd hand	2001	20,000
33	owner		MF 290, 2nd hand	1980	43,000
34	operator		Landini 7860, 2nd h	1999	9,200
35	owner		Ford 5000, 2nd hand	2000	15,000
36	owner		New Holland, new	1998	121,000
37	owner		MF 178, 2nd hand	1994	38,000
39	owner/operator		Ford 5000, 2nd hand	1998	23,000
40	owner		Ford 5000, 2nd hand	2001	25,000
26	owner/operator	Tshisaulu	MF 135, 2nd hand	1994	28,000
27	owner		MF 165, 2nd hand	1992	21,500
28	owner		MF 165, 2nd hand	1999	20,000
29	owner/operator		New Holland, new	2001	160,000
46	owner/operator		MF 135, 2nd hand	1993	10,000
47	owner		MF 135, 2nd hand	1992	10,000

Table 1. (**Continuation**) List of tractor brands and purchase information by respondents

ID	Status of respondent	Town	Tractor make, model & purchase	Year purchased	Purchase price [Rand]
Malamulele					
42	owner	Maphophe	Fiat 540, 2nd hand	1981	24,000
43	owner		MF 165, 2nd hand	1998	20,000
50	owner/operator	Mavambe	Ford 5000, 2nd hand	1998	20,000
48	owner	Mhinga	Ford 5000, 2nd hand	1985	15,000
49	owner/operator	Xhikundu	Ford 5000, 2nd hand	1997	25,000
41	owner		MF 165, 2nd hand	2001	35,000
Co operatives					
21	operator	Dzind Co-op	MF 188, 2nd hand	1999	25,000
14	manager	Khakhu Co-op	Fiat 7066, new	1991	125,000
8	operator	Lwamondo Project	John Deere, new	2001	350,000
10	operator	Madzivhandila Center	Fiat 7066, new	1991	130,000
44	administrator	Mhinga Co-op	Fiat 880 DT, new	1991	103,000
38	manager	Mvelaphanda Co-op	Landini, new	1998	95,000
9	operator	Palmaryville Center	Ford 5610, new	1992	110,000

Respondents from Mutale, Thohoyandou, Malamulele and Co operatives within the same three areas.

Table 2. List of implements owned by respondents

Type of implement	Mutale	Thohoyandou	Malamulele	Cooperatives	Total
Moldboard plow	18	21	8	6	53
Disc plow	6	4	3	2	15
Trailer	8	7	3	4	22
Planter	—	—	1	3	4
Fertilizer distributor	1	—	—	1	2
Disc harrow	10	12	1	6	29
Mower	1	—	—	2	3
Hammer mill	3	1	1	1	6
Cultivator	1	—	—	1	2
Bailer	—	—	—	1	1
Sprayer	1	—	—	1	2
Forage harvester	—	—	—	1	1
Water cart	—	—	—	1	1
Ripper	1	—	—	1	2
Maize sheller	—	—	—	1	1
Total	50	45	17	32	144

Small-scale farmers are compelled to leave land uncultivated by both the lack of access to machinery to capitalize on summer moisture for seedbed preparation and seed germination, and the lack of money for fertilizer, seeds, chemicals, and labor (Limpopo Department of Agriculture, 2006). Smallholders in Limpopo farm over 39,000 ha of irrigated land and 600,000 ha of rain fed land. If we assume one 65-kW tractor working 450 ha a year, they would need 87 tractors on the irrigated land and 1,333 on the rainfed land, or 1,420 in total. However, Limpopo has only around 400

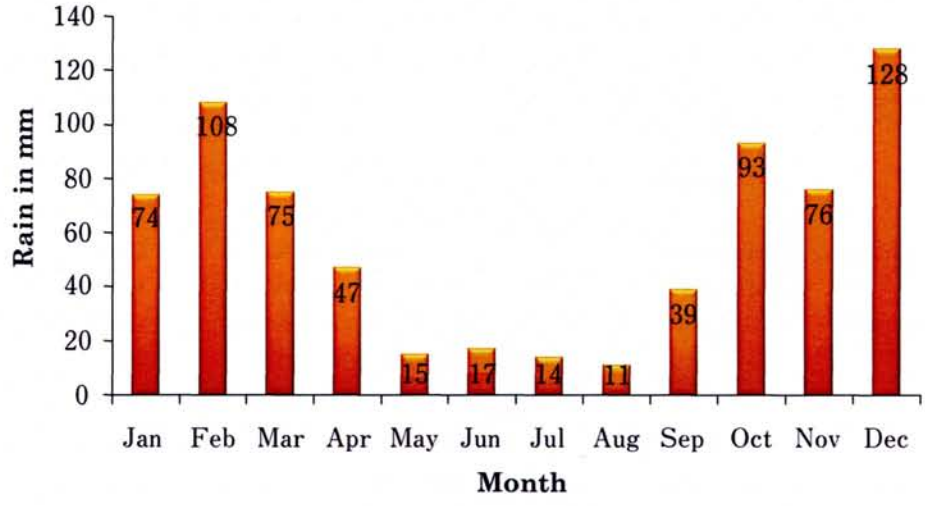

Fig. 2. Average monthly rainfall in millimeters, 1997–2008.

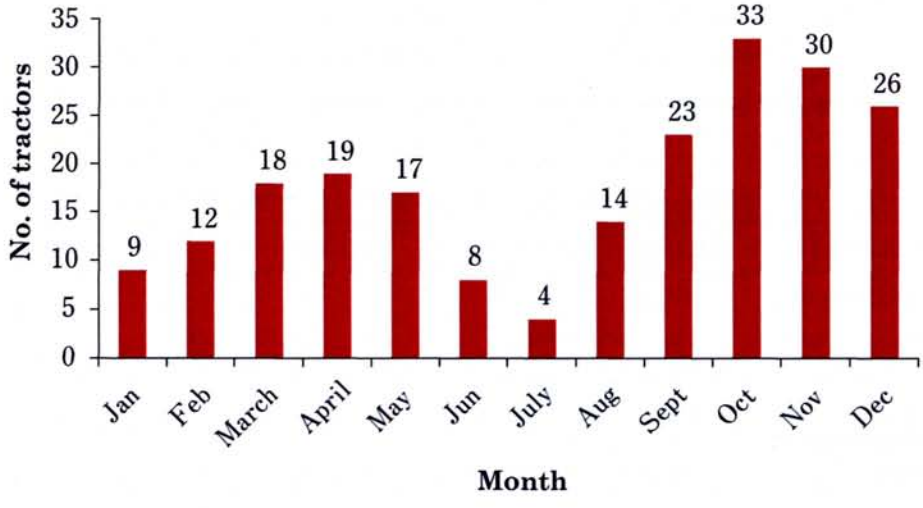

Fig. 3. Number of tractors working per month from the respondent list.

Table 3. Number of workable days per month counted from the historical rainfall data for the period 2000 to 2006

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	8	8	8	2	1	2	0	0	1	4	4	3
2001	0	10	10	2	1	1	0	0	0	0	9	2
2002	0	0	1	3	0	2	0	1	2	3	2	3
2003	1	0	4	0	0	1	0	0	0	5	4	6
2004	2	4	7	4	0	3	0	3	2	0	2	5
2005	2	2	1	3	0	0	0	1	0	1	2	3
2006	2	9	5	0	0	0	0	0	2	5	4	14
Mean	2.1	4.7	5.1	2.0	0.3	1.2	0	0.6	1.0	2.6	3.9	5.1

It was assumed that cultivation is possible for 1 day when precipitation is in the range from 5 mm to 10 mm, 2 days for 10 mm to 20 mm, 3 days for more than 20 mm. When consecutive rainfall occurred, 1 day was added.

Table 4. Numbers of new and old tractors from the respondents

	Mutale	Thohoyandou	Malamulele	Cooperatives	Total
New tractors	0	3	0	6	9
Old tractors	16	18	6	1	41
Total	16	21	6	7	50

New tractors are tractors bought first hand or by the 1st user. Old tractors are those tractors bought as 2nd or 3rd hand.

Table 5. Monthly tractor operational costs (R)

	Mutale	Thohoyandou	Malamulele	Cooperatives
Fuel price	10/L	10/L	10/L	10/L
Fuel consumption	21 L/ha	21 L/ha	21 L/ha	21 L/ha
Area worked	4 ha/day	4 ha/day	4 ha/day	4 ha/day
Working days	20/month	20/month	20/month	20/month
Tillage charge/ha	700	800	650	900
Driver's wage	1,200	1,300	1,100	1,600
Maintenance	2,200	2,500	2,000	3,000
Monthly profit	35,800	43,400	32,100	50,600

Income of Mutale (700/ha X number of hectors/day4h X working days of 20=56,000). Operation costs (R10-00 Fuel price/liter X number of liters consumed per hectar of 21 liters X number of hectars worked per day of 4 ha X number of working days of 20+ driver's wage of 1,200+maintenance cost of 2,200=20,200) Profit for Mutale is defined as Income — Operation costs.

tractors, with powers of 28 to 70 kW (Limpopo Department of Agriculture, 2006).

Vhembe district was the center of the former Venda homeland, which was autonomous from 1979 to 1994. Funding from the South African government supported many projects, including tractor hire schemes. The post-apartheid dismantling of such "Bantustans" has meant the discontinuation of such subsidies. This financial vacuum has left agricultural communities with few alternatives to meet their mechanization needs (Fischer, 2000). Operational costs such as fuel, spare parts, drivers' wages, and maintenance make it difficult for owners to run tractors, especially for hire. A complicating factor is that during autonomous of the former homeland, the Department of Agriculture was also running a subsidized tractor hire scheme, which undercut private owners to the point where they could not afford to hire drivers, thus reducing availability. Further, farms are sparsely located, and the cost of travel further reduces profits. The low returns fail to cover the costs of maintenance.

In Mutale, Thohoyandou, and Malamulele, individual owners, relying on advice from government staff, were charged R650-800/ha for tillage. In contrast, cooperatives charged R900-1,000/ha. Fuel price increases, the cost of spare parts, and maintenance costs impose a burden on the farmers. Professional mechanics are not available locally and must travel up to 120 km, for which they charge. Therefore, hiring out tractors can be profitable only if the tractors work all year. The farmers own a variety of tractors and implements. Because they must wait for rain before they can till their lands, many must queue for equipment, so some end up missing out. Yet, as shown in Fig. 3 tractors remain unused for long periods. Not enough tractors exist to cover all land within the brief time available after rain. So some farmers resort to animal traction or manual labor.

Table 5 shows monthly operational costs. Monthly income is given by tillage charge/ha×

area worked × working days per month. Monthly profit is the total monthly income minus the total operating costs. Tractors are profitable for only a few months, but the profitability is not sustainable year-round as they are parked for many months (Fig. 3). Of the 50 respondents, only 12 had any training in machinery operation. Many farm implements lie unused for want of knowing how to use them. This problem is made worse by the failure of suppliers to supply operating manuals and training. Four factors determine the low level of use of tractors and machinery in Vhembe. These can be overcome as follows:

Climate: The region's short period of low rainfall makes it difficult for farmers to till all of their lands in time. A coverage plan based on available working days (Table 3) has been drawn up to enable the small-scale farmers of Vhembe to maximize coverage.

Shortage of tractors: Not enough tractors are available to carry out farm operations. The MERECAS policy (Limpopo Department of Agriculture, 2006) identifies a serious need to increase the number of tractors. Any program to increase the number must also define how they can be fully used during the dry months in order to achieve sustainability.

Lack of operating skills: Farmers do not know how to operate some of their implements. Information days, demonstrations, training courses, workshops, and road shows would allow them to improve their skills.. Through the Limpopo Agribusiness Development Academy (LADA), the Limpopo department of Agriculture is coming up with a training program on Tractors Operation and Management to be conducted at the Madzivhandila and Tompi Seleka College Agriculture, after which farmers can be recommended for subsidy when purchasing farm machinery. Training must focus on the farmers' needs and be offered at their level, and must be scheduled so as not to interfere with the peak production period. The dry season would be an ideal time.

Tractor operating costs: Hiring out tractors can make money only if the tractors are working all year-round. The down-time can be reduced if irrigation can allow some crops to be grown during the dry season. In some cases the tractors can power the irrigation pumps. To reduce cost, the development of small implements such as a two-row planter could motivate small-scale farmers. With the involvement of the Department of Roads and Transport, trailers could be used to haul produce, building materials, farm inputs, or firewood. Municipalities could be encouraged to give tenders to local operators for community services such as grass mowing along roads and in playgrounds or the removal of garbage.

4. Conclusion

A report and proposal to improve tractor use will be made to policy makers through the Ministry of Agriculture. The proposal will aim to create awareness and invite the involvement of all stakeholders and farmers in Vhembe.

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